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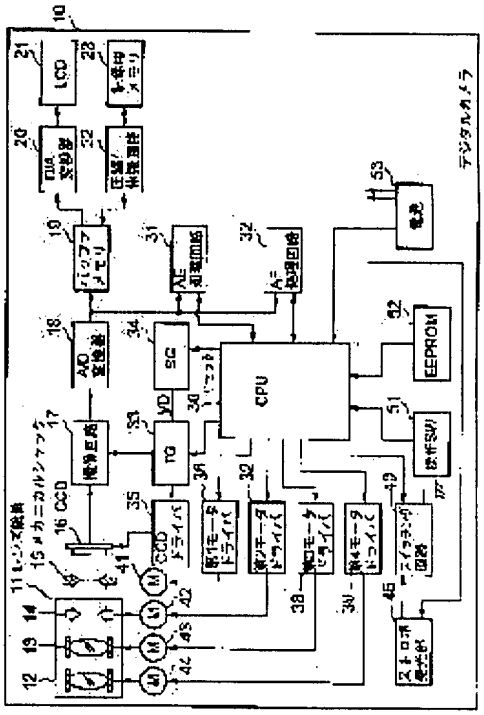
(54) IMAGE PICKUP DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an image pickup device that can always make a release time lag constant.

SOLUTION: The image pickup device is provided with image pickup lenses 12, 13 that form an object image onto an image pickup face, a CCD 16 and an image pickup circuit 17 that store the formed object image as electric charges by each pixel for an exposure time to convert the image into the image signal, an aperture 14 that is provided on an image pickup optical path, a mechanical shutter 15 provided on the image pickup optical path, an EEPROM 52 that stores a prescribed time over a maximum time required for the aperture 14 from drive stat up to an end of drive, an operation switch 51 including a release switch to instruct start of an image pickup operation and a CPU 30 that starts storage of electric charges of the CCD 16 after a lapse of the prescribed time stored in the EEPROM 52 after the instruction by the release switch and controls the exposure by a time from the start of electric charge storage until closing of the mechanical shutter 15.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The taking lens which carries out image formation of the photographic subject image to an image pick-up side, and the image sensor which changes into a video signal the photographic subject image by which image formation was carried out with this taking lens by accumulating as a charge for every pixel into the exposure time, Drawing formed on the image pick-up optical path which penetrates the above-mentioned image pick-up lens, and the mechanical shutter which controls the quantity of light which it is arranged on the above-mentioned image pick-up optical path, and carries out incidence to the above-mentioned image sensor by the switching action, A storage means to memorize the predetermined time amount beyond the maximum time amount required by actuation termination from actuation initiation of the above-mentioned drawing, After directions with a release means to direct initiation of photography actuation, and this release means are made and the predetermined time memorized by the above-mentioned storage means passes, the charge storage of the above-mentioned image sensor is started. Image pick-up equipment characterized by providing the light exposure control means which controls light exposure by time amount until it closes the above-mentioned mechanical shutter from this charge storage initiation.
[Claim 2] The taking lens which carries out image formation of the photographic subject image to an image pick-up side, and the image sensor which changes into a video signal the photographic subject image by which image formation was carried out with this taking lens by accumulating as a charge for every pixel into the exposure time, The mechanical shutter which controls the quantity of light which it is arranged on the image pick-up optical path which passes the above-mentioned image pick-up lens, and carries out incidence to the above-mentioned image sensor by the switching action, A storage means to memorize the predetermined time beyond the maximum time amount taken to complete the shift to an open condition from the closed state of this mechanical shutter, After directions with a release means to direct initiation of photography actuation, and this release means are made and the predetermined time memorized by the above-mentioned storage means passes, the charge storage of the above-mentioned image sensor is started. Image pick-up equipment characterized by providing the light exposure control means which controls light exposure by time amount until it closes the above-mentioned mechanical shutter from this charge storage initiation.
[Claim 3] The taking lens which carries out image formation of the photographic subject image to an image pick-up side, and the image sensor which changes into a video signal the photographic subject image by which image formation was carried out with this taking lens by accumulating as a charge for every pixel into the exposure time, Drawing formed on the image pick-up optical path which penetrates the above-mentioned image pick-up lens, and the mechanical shutter which controls the quantity of light which it is arranged on the above-mentioned image pick-up optical path, and carries out incidence to the above-mentioned image sensor by the switching action, A storage means to memorize the predetermined time amount beyond time amount longer than either among the maximum time amount taken to complete the shift to the maximum time amount required by actuation termination from actuation initiation of the above-mentioned drawing, and an open condition from the closed state of a mechanical shutter, After directions with a release means to direct initiation of photography actuation, and this release means are made and the predetermined time memorized by the above-mentioned storage means passes, the charge storage of the above-mentioned image sensor is started. Image pick-up equipment characterized by providing the light exposure control means which controls light exposure by time amount until it closes the above-mentioned mechanical shutter from this charge storage initiation.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the image pick-up equipment which photos still pictures, such as a digital still camera and a film-based camera.
[0002]
[Description of the Prior Art] It has the conventional mechanical shutter and drawing 5 explains actuation after carrying out release actuation until it exposes actually in the digital still camera using CCD as an image sensor.
[0003] - (1-5) illustrates about each signal wave form when not performing drawing 5 (1-1) and drawing actuation.
[0004] By CCD which is an image sensor, in order not to make release actuation but to perform animation display by the liquid crystal display monitor the case of only performing animation display by the liquid crystal display monitor, after the charge **** pulse shown in drawing 5 (1-3) is stopped, the time amount R1 until the read pulse shown in drawing 5 (1-4) is outputted turns into the exposure time, and the charge accumulated by this read pulse between the exposure time R1 comes to be read.
[0005] If a deer is carried out, release actuation is made as shown in drawing 5 (1-1), and a release signal starts, after making a charge **** pulse output synchronizing with first Vertical Synchronizing signal VD shown in drawing 5 (1-2), the time amount taken for a mechanical shutter to close as shown in drawing 5 (1-5) (until it becomes 50% which the area of a shutter curtain is exposing at accuracy) turns into the substantial exposure time R2.
[0006] Therefore, after release is operated, by the time actual exposure is started, the time lag tangent line 1 until a charge **** pulse is outputted synchronizing with Vertical Synchronizing signal VD will arise.
[0007] By the way, since time amount after release is operated actually until Vertical Synchronizing signal VD is outputted is not fixed, the above-mentioned time lag tangent line will be changed within the limits of the period of Vertical Synchronizing signal VD as a result.
[0008] On the other hand, - (2-6) illustrates about each signal wave form in the case of performing drawing 5 (2-1) and drawing actuation.
[0009] In order not to make release actuation but to perform the animation display in a liquid crystal display monitor like the above the case of only performing the animation display in a liquid crystal display monitor, in CCD which is an image sensor After the charge **** pulse shown in drawing 5 (2-3) is stopped, the time amount R3 until the read pulse shown in drawing 5 (2-4) is outputted turns into the exposure time, and the charge accumulated by this read pulse between the exposure time R3 comes to be read.
[0010] Since it is not the drawing value for which it asks after first Vertical Synchronizing signal VD which drives until drawing serves as a predetermined value, as shown in drawing 5 (2-5), and is shown in drawing 5 (2-2) is outputted until actuation of the above-mentioned drawing is completed if a deer is carried out, release actuation is made as shown in drawing 5 (2-1), and a release signal starts and, exposure cannot be started.
[0011] Then, the charge **** pulse of the beginning after actuation of drawing is completed is considered as exposure initiation, and the time amount taken for a mechanical shutter to close as shown in drawing 2 (2-6) turns into the substantial exposure time R4.
[0012] Therefore, after release is operated, by the time actual exposure is started, the time lag tangent line 2 until actuation of drawing is completed will arise.
[0013] By the way, time amount after release is operated actually until actuation of drawing is completed will not be fixed according to the value of drawing at that time, and the above-mentioned time lag tangent line will be changed as a result within the limits of the time amount taken for drawing to operate to its reverse from an open value to maximum.
[0014]

[Problem(s) to be Solved by the Invention] If it changes without release time lag being fixed by the digital still camera as mentioned above, even if it is the user who is [even if] skilled in actuation of a camera enough, a photograph will not be able to be taken in the timing and composition for which it asks when photoing the photographic subject which moves especially at a high speed, but it will become the camera which is easy to miss a shutter chance and which is very hard to use.

[0015] The place which this invention was made in view of the above actual condition, and is made into the object is always making release time lag regularity, and is irrespective of the single copy / continuous shooting of a still picture to offer the image pick-up equipment which is easy to grasp release timing.

[0016]

[Means for Solving the Problem] The taking lens with which invention according to claim 1 carries out image formation of the photographic subject image to an image pick-up side, The image sensor which changes into a video signal the photographic subject image by which image formation was carried out with this taking lens by accumulating as a charge for every pixel into the exposure time, Drawing formed on the image pick-up optical path which penetrates the above-mentioned image pick-up lens, and the mechanical shutter which controls the quantity of light which it is arranged on the above-mentioned image pick-up optical path, and carries out incidence to the above-mentioned image sensor by the switching action, A storage means to memorize the predetermined time amount beyond the maximum time amount required by actuation termination from actuation initiation of the above-mentioned drawing, After directions with a release means to direct initiation of photography actuation, and this release means are made and the predetermined time memorized by the above-mentioned storage means passes, the charge storage of the above-mentioned image sensor is started. It is characterized by providing the light exposure control means which controls light exposure by time amount until it closes the above-mentioned mechanical shutter from this charge storage initiation.

[0017] Since release time lag was made to become always fixed from such a configuration, then actuation initiation of drawing according to the maximum time amount required by actuation termination, Since it shall very be easy to grasp release timing, without changing release time lag according to the magnitude of opening of drawing in the event even if it faces photography of the photographic subject which moves especially at a high speed It becomes possible to perform photography as the intention which release timing always suited.

[0018] The taking lens with which invention according to claim 2 carries out image formation of the photographic subject image to an image pick-up side, The image sensor which changes into a video signal the photographic subject image by which image formation was carried out with this taking lens by accumulating as a charge for every pixel into the exposure time, The mechanical shutter which controls the quantity of light which it is arranged on the image pick-up optical path which passes the above-mentioned image pick-up lens, and carries out incidence to the above-mentioned image sensor by the switching action, A storage means to memorize the predetermined time beyond the maximum time amount taken to complete the shift to an open condition from the closed state of this mechanical shutter, After directions with a release means to direct initiation of photography actuation, and this release means are made and the predetermined time memorized by the above-mentioned storage means passes, the charge storage of the above-mentioned image sensor is started. It is characterized by providing the light exposure control means which controls light exposure by time amount until it closes the above-mentioned mechanical shutter from this charge storage initiation.

[0019] Since release time lag was made to become always fixed according to the maximum time amount taken to complete such a configuration, then the shift to an open condition from the closed state of a mechanical shutter, Even if it faces photography of the photographic subject which moves especially at a high speed, while being very easy to grasp release timing, without changing release time lag according to actuation of a mechanical shutter Since release time lag is made to regularity also in any of a single copy and continuous shooting Control of a photography sequence can become easy, and circuit magnitude can be made small, in addition the time interval of two or more photography images can be extremely made into an equal especially at the time of continuous shooting, and a motion of the photographic subject in two or more images photoed continuously can be expressed as a more natural thing.

[0020] The taking lens with which invention according to claim 3 carries out image formation of the photographic subject image to an image pick-up side, The image sensor which changes into a video signal the photographic subject image by which image formation was carried out with this taking lens by accumulating as a charge for every pixel into the exposure time, Drawing formed on the image pick-up optical path which penetrates the above-mentioned image pick-up lens, and the mechanical shutter which controls the quantity of light which it is arranged on the above-mentioned image pick-up optical path, and carries out incidence to the above-mentioned image sensor by the switching action, A storage means to memorize the predetermined time amount beyond time amount longer than either among the maximum time amount taken to complete the shift to the maximum time amount required by actuation termination from actuation initiation of the above-mentioned drawing, and an open condition from the closed state of a mechanical

shutter, After directions with a release means to direct initiation of photography actuation, and this release means are made and the predetermined time memorized by the above-mentioned storage means passes, the charge storage of the above-mentioned image sensor is started. It is characterized by providing the light exposure control means which controls light exposure by time amount until it closes the above-mentioned mechanical shutter from this charge storage initiation.

[0021] Since release time lag was made to become always fixed from either of the maximum time amount taken to complete the shift to the open condition required by actuation termination from such a configuration, then actuation initiation of drawing from the closed state of the maximum time amount and a mechanical shutter according to the longer one, Even if it faces photography of the photographic subject which moves especially at a high speed, while being very easy to grasp release timing, without changing release time lag Since release time lag is made to regularity also in any of a single copy and continuous shooting, control of a photography sequence becomes easy and circuit magnitude can be made small.

[0022]

[Embodiment of the Invention] The gestalt of operation of this invention is explained with reference to a drawing below.

[0023] (Gestalt of the 1st operation) Drawing 1 shows the basic configuration at the time of applying to a digital still camera (it being called a "digital camera" for short below) as a gestalt of operation of the 1st of this invention, and 10 is a digital camera.

[0024] In the lens barrel 11 of this digital camera 10, a zoom lens 12, the focal lens 13, and drawing 14 are formed. After the light figure acquired through this lens barrel 11 penetrates the mechanical shutter 15, image formation of it is carried out on the image pick-up side of CCD16 which is an image sensor.

[0025] CCD16 accumulates and outputs the charge for every pixel into the exposure time, and the output is changed into a video signal by the image pick-up circuit 17. A/D converter 18 digitizes the video signal of the analog value which this image pick-up circuit 17 outputs, and it outputs to buffer memory 19.

[0026] Buffer memory 19 is shown a monitor table by the electrochromatic display panel 21 with a back light (it is indicated as "LCD" by a diagram), after the video signal which memorizes temporarily the video signal which A/D converter 18 outputs, and was memorized by this buffer memory 19 is read to D/A converter 20 and changed into an analog value.

[0027] Moreover, the video signal which buffer memory 19 memorized is recorded and saved in the memory 23 for record which can be detached and attached and which consists of flash memories, after being read also to compression/expanding circuit 22 and compressing the amount of data suitably by the specified compression approach.

[0028] If the video signal saved in this memory 23 for record is read at the time of a playback mode, reverse processing develops in compression/expanding circuit 22 at the time of record, and it is restored to a bit map-like video signal, and the acquired video signal will be memorized by buffer memory 19, and a display output will be carried out by the electrochromatic display panel 21 through above-mentioned D/A converter 20.

[0029] a deer -- carrying out -- this -- a digital camera -- ten -- the whole -- generalizing -- controlling -- a thing -- CPU -- 30 -- it is -- this -- CPU -- 30 -- receiving -- photography -- the time -- AE (automatic exposure) -- an operation -- carrying out -- air entrainment -- a circuit -- 31 -- photography -- the time -- AF (automatic focus) -- an operation -- carrying out -- AF -- processing -- a circuit -- 32 -- a timing generator -- (-- TG --) -- 33 -- a synchronizing signal generator -- (-- SG --) -- 34 -- connecting -- having .

[0030] A synchronizing signal generator 34 oscillates Vertical Synchronizing signal VD used as the criteria for driving CCD16 under control of CPU30, and sends it out to a timing generator 33.

[0031] A timing generator 33 oscillates the various timing signals which contain a charge **** pulse and a read pulse based on this Vertical Synchronizing signal VD, and sends them out to the CCD driver 35 which drives the above-mentioned image pick-up circuit 17 and the above CCD 16.

[0032] Moreover, CPU30 is connected also with the 1st thru/or 4th Motor Driver 36-39, and a switching circuit 40. the -- one -- Motor Driver -- 36 -- the above -- a mechanical -- a shutter -- 15 -- a switching action -- carrying out -- making -- the -- one -- a motor -- (-- M --) -- 41 -- driving . 2nd Motor Driver 37 drives the 2nd motor 42 made to rotate the above-mentioned drawing 14. 3rd Motor Driver 38 drives the 3rd motor 43 to which the above-mentioned focal lens 13 is moved. 4th Motor Driver 39 drives the 4th motor 44 to which the above-mentioned zoom lens 12 is moved.

[0033] A switching circuit 40 carries out switching control of charge and luminescence with the stroboscope light-emitting part 45 according to directions of CPU30.

[0034] Moreover, the direct input of the manipulate signal from a menu button, a release switch, and the actuation switch (SW) 51 of various mode switches and others is carried out to CPU30, and this CPU30 is connected to it with

EEPROM52 which memorized the control program for performing generalization actuation of all the above circuits.
[0035] Moreover, the predetermined time value beyond corresponding to the maximum time amount taken to result in the condition of having narrowed down most for example, from the open condition of the above-mentioned drawing 14, as one of the characteristic value of this digital camera 10 shall be memorized by this EEPROM52.
[0036] In addition, required power is supplied from the cell 53 which is a power source to each circuit which began and mentioned CPU30 above.
[0037] The fundamental actuation especially at the time of a recording mode of this equipment is as follows. That is, image formation of the photographic subject image is carried out on the image pick-up side of CCD16 through a zoom lens 12, the focal lens 13, drawing 14, and the mechanical shutter 15, and a CCD output is changed into a video signal by the image pick-up circuit 17.
[0038] After this video signal is digitized by A/D converter 18, it is temporarily memorized by buffer memory 19. And the video signal memorized by buffer memory 19 is again analog-ized by D/A converter 20, and is shown in the electrochromatic display panel 21 a monitor table.
[0039] moreover, the video signal memorized by buffer memory 19 -- compression/expanding circuit 22 -- JPEG (Joint Photograph coding Experts Group) etc. -- a data compression is suitably performed by the method and it is recorded on the memory 23 for record. (Conversely at the time of playback, compression/expanding circuit 22 elongates the content of the memory 24 for record, buffer memory 19 is made to memorize conversely, and the electrochromatic display panel 21 is made to display it on it as this) Exposure is automatically adjusted by the air entrainment circuit 31 based on the output signal of A/D converter 18 again. Specifically a digital video signal is integrated by the air entrainment circuit 31, the integrated value (AE assessment value) is supplied to CPU30, as a result, adjustable control of the charge storage time in CCD16 by the CCD driver 34 is carried out, and exposure is adjusted automatically.
[0040] Furthermore, a focus location is automatically adjusted by AF processing circuit 32 based on the output signal of A/D converter 16. CPU30 which acquired AF assessment value by specifically integrating through the high-pass filter which does not illustrate a digital video signal by AF processing circuit 32 It is what the 3rd motor 43 is driven [what] through 3rd Motor Driver 38, and moves the focal lens 13 to the cross direction of an optical axis. The high frequency component in a video signal increases most because contrast goes up, and a focus can be automatically doubled by setting the focal lens 13 as the location where AF assessment value serves as max.
[0041] Next, the exposure control action in the gestalt of the above-mentioned implementation is explained with reference to the timing chart of drawing 2 . In addition, suppose a release switch that the condition of having pushed in the condition of having performed two steps of actuation, the condition of having pushed shallowly, and the condition of having pushed in to the last, and having pushed shallowly, to first release and the last is called second release.
[0042] When a release switch changes into the condition of first release, while AE actuation and AF actuation which were mentioned above are performed In order to perform the monitor display in the electrochromatic display panel 21, in CCD16 which is an image sensor After the charge **** pulse shown in drawing 2 (4) is stopped, the time amount R5 until the read pulse shown in drawing 2 (5) is outputted turns into the exposure time, and the charge accumulated by this read pulse between the exposure time R5 comes to be read.
[0043] As a synchronizing signal generator 34 is reset that it is not related and compulsorily by the actuation timing till then because CPU30 resets a synchronizing signal generator 34 immediately as it is shown in drawing 2 (2) corresponding to this release signal, when actuation of second release is made as a deer is carried out and it is shown in drawing 2 (1), and a release signal starts, and shown in drawing 2 (3), Vertical Synchronizing signal VD is anew outputted instancy from a synchronizing signal generator 34.
[0044] Until the predetermined time value T1 corresponding to actuation (for example, actuation until it reaches the maximum drawing value from an open condition) of the drawing 14 beforehand memorized by EEPROM52 passes in CPU30, after this Vertical Synchronizing signal VD is outputted By making the charge **** pulse shown in drawing 2 (4) output continuously, and extracting by 2nd Motor Driver 37 and the 2nd motor 42 if needed between them, after making 14 set it as the optimal drawing value in the event of obtaining in the above-mentioned AE actuation as shown in drawing 2 (6) Stop this charge **** pulse, and it stands by until the exposure time R6 similarly acquired in the above-mentioned AE actuation after that passes. The mechanical shutter 15 is made to be closed by 1st Motor Driver 36 and the 1st motor 41, as shown in drawing 2 (7) after that, and the charge accumulated by the read pulse shown by drawing 2 (5) is made to read to the image pick-up circuit 17.
[0045] Therefore, after a synchronizing signal generator 34 is compulsorily reset with actuation of second release, Vertical Synchronizing signal VD is outputted and the above-mentioned predetermined time value T1 passes, exposure will be started, and the sum of the time amount applicable to this predetermined time value T1 and time amount after actuation of second release is made with a release switch until the forced output of Vertical Synchronizing signal VD is

carried out serves as the release time lag tangent line 3.
[0046] It becomes possible, after taking into consideration as a result the time amount which actuation of drawing 14 takes regardless of the condition of a digital camera 10, since this release time lag tangent line 3 was the characteristic value of this digital camera 10 and it was a fixed value to always make release time lag regularity.
[0047] Therefore, even if it is a case so that the photographic subject which moves at high speed so that release time lag may not be changed according to the magnitude of opening of the drawing 14 in that event may be photoed, especially the user of this digital camera 10 can photo desired timing by grasping the release time lag of a proper to this digital camera 10, and a photographic subject can be photoed by framing.
[0048] (Gestalt of the 2nd operation) The case where the gestalt of operation of the 2nd of this invention is applied to a digital camera is explained with reference to a drawing.
[0049] In addition, the graphic display and explanation are omitted as what was mostly shown in above-mentioned drawing 1 about the basic configuration of a digital camera, and a thing which gives the same sign to the same part since it is the same.
[0050] Next, also in the gestalt of this 2nd operation, the exposure control action at the time of continuous shooting is explained with reference to the timing chart of drawing 3 .
[0051] When a release switch changes into the condition of first release, while AE actuation and AF actuation are performed In order to perform the monitor display in the electrochromatic display panel 21, in CCD16 which is an image sensor After the charge **** pulse shown in drawing 3 (4) is stopped, the time amount R7 until the read pulse shown in drawing 3 (5) is outputted turns into the exposure time, and the charge accumulated by this read pulse between the exposure time R7 comes to be read.
[0052] As a synchronizing signal generator 34 is reset that it is not related and compulsorily by the actuation timing till then because CPU30 resets a synchronizing signal generator 34 immediately as it is shown in drawing 3 (2) corresponding to this release signal, when actuation of second release is made as a deer is carried out and it is shown in drawing 3 (1), and a release signal starts, and shown in drawing 3 (3), Vertical Synchronizing signal VD is anew outputted instancy from a synchronizing signal generator 34.
[0053] Until the predetermined time value T2 beyond the maximum time amount taken to complete the shift to an open condition from the closed state of the above-mentioned mechanical shutter 15 beforehand memorized by EEPROM52 after this Vertical Synchronizing signal VD is outputted in CPU30 passes After making the charge **** pulse shown in drawing 3 (4) output continuously, this charge **** pulse is stopped. With, stand by until the exposure time R8 acquired in the account AE actuation of Gokami passes, and the mechanical shutter 15 is made to be closed by 1st Motor Driver 36 and the 1st motor 41, as shown in drawing 3 (6) after that. The charge accumulated by the read pulse shown by drawing 3 (5) is made to read to the image pick-up circuit 17.
[0054] Therefore, after a synchronizing signal generator 34 is compulsorily reset with actuation of second release, Vertical Synchronizing signal VD is outputted and the above-mentioned predetermined time value T2 passes, exposure will be started, and the sum of the time amount applicable to this predetermined time value T2 and time amount after actuation of second release is made until the forced output of Vertical Synchronizing signal VD is carried out serves as the release time lag tangent line 4.
[0055] Then, after opening spacing of the time amount beforehand defined by continuous-shooting setting out Until the above-mentioned predetermined time value T2 passes based on the output of Vertical Synchronizing signal VD like the above again The mechanical shutter 15 is made to open, as the charge **** pulse shown in drawing 3 (4) is made to output continuously, it doubles and it is shown in drawing 3 (6). And stop this charge **** pulse, stand by until the proper exposure time R9 passes henceforth, and the mechanical shutter 15 is made to be closed after that, and the charge accumulated by the read pulse shown by drawing 3 (5) is made to read to the image pick-up circuit 17.
[0056] Henceforth, the above-mentioned exposure actuation is continuously performed until the number of photography images turns into a number which is set up with this digital camera 10 and in which a seriography is possible, or the condition of second release is canceled or the storage capacity of buffer memory 19 becomes full.
[0057] It becomes possible to carry out a deer, and to always make regularity the release time lag at the time of continuous shooting, after taking into consideration as a result the time amount which actuation of the mechanical shutter 15 takes regardless of the condition of a digital camera 10, since the above-mentioned release time lag tangent line 4 was the characteristic value of this digital camera 10 and it was a fixed value.
[0058] In addition, since the predetermined time value T2 after above-mentioned Vertical Synchronizing signal VD is outputted especially at the time of continuous shooting until it starts exposure can be arranged with homogeneity, the time interval of the image photoed continuously can be extremely made into an equal, and a motion of the photographic subject in two or more images photoed continuously will be expressed as a more natural thing.

[0059] Furthermore, since the release time lag tangent line 4 is made to regularity also in any of a single copy and continuous shooting, control of the photography sequence in CPU30 becomes easy, and circuit magnitude can be made small.

[0060] (Gestalt of the 3rd operation) The case where the gestalt of operation of the 3rd of this invention is applied to a digital camera is explained with reference to a drawing.

[0061] In addition, the graphic display and explanation are omitted as what was mostly shown in above-mentioned drawing 1 about the basic configuration of a digital camera, and a thing which gives the same sign to the same part since it is the same.

[0062] Next, the exposure control action at the time of the single copy photography in the gestalt of this 3rd operation is explained with reference to the timing chart of drawing 4 .

[0063] When a release switch changes into the condition of first release, while AE actuation and AF actuation are performed In order to perform the monitor display in the electrochromatic display panel 21, in CCD16 which is an image sensor After the charge **** pulse shown in drawing 4 (4) is stopped, the time amount R10 until the read pulse shown in drawing 4 (5) is outputted turns into the exposure time, and the charge accumulated by this read pulse between the exposure time R10 comes to be read.

[0064] As a synchronizing signal generator 34 is reset that it is not related and compulsorily by the actuation timing till then because CPU30 resets a synchronizing signal generator 34 immediately as it is shown in drawing 4 (2) corresponding to this release signal, when actuation of second release is made as a deer is carried out and it is shown in drawing 4 (1), and a release signal starts, and shown in drawing 4 (3), Vertical Synchronizing signal VD is anew outputted instancy from a synchronizing signal generator 34.

[0065] The time amount corresponding to actuation (for example, actuation until it reaches the maximum drawing value from an open condition) of drawing 14 beforehand memorized by EEPROM52 in CPU30 after this Vertical Synchronizing signal VD is outputted, The inside of the maximum time amount taken to complete the shift to an open condition from the closed state of the above-mentioned mechanical shutter 15, The charge **** pulse shown in drawing 4 (4) is made to output continuously until predetermined time value T3 corresponding to any or the larger one passes. And by extracting by 2nd Motor Driver 37 and the 2nd motor 42 if needed between them, after making 14 set it as the optimal drawing value in the event of obtaining in AE actuation as shown in drawing 4 (6) Stop this charge **** pulse, and it stands by until the exposure time R11 acquired in the above-mentioned AE actuation after that passes. The mechanical shutter 15 is made to be closed by 1st Motor Driver 36 and the 1st motor 41, as shown in drawing 4 (7) after that, and the charge accumulated by the read pulse shown by drawing 4 (5) is made to read to the image pick-up circuit 17.

[0066] Here, the maximum time amount taken for drawing 14 to reach the maximum drawing value for example, from an open condition shall be made into T3, the direction of this time amount T3 shall consider as a larger thing as compared with time amount T four taken for the above-mentioned mechanical shutter 15 to shift to an open condition from a closed state, and the initiation timing of exposure shall be controlled according to above-mentioned maximum time amount T3 by the side of drawing 14.

[0067] Therefore, after a synchronizing signal generator 34 is compulsorily reset with actuation of second release, Vertical Synchronizing signal VD is outputted and above-mentioned predetermined time value T3 passes, exposure will be started, and the sum of the time amount applicable to this predetermined time value T3 and time amount after actuation of second release is made until the forced output of Vertical Synchronizing signal VD is carried out serves as the release time lag tangent line 5.

[0068] It becomes possible to carry out a deer, and to always make release time lag regularity also in any of single copy photography and continuous shooting, after taking into consideration as a result the time amount which actuation of the both sides of drawing 14 and the mechanical shutter 15 takes regardless of the condition of a digital camera 10, since this release time lag tangent line 5 was the characteristic value of this digital camera 10 and it was a fixed value.

[0069] In addition, since a predetermined time value after above-mentioned Vertical Synchronizing signal VD is outputted especially at the time of continuous shooting until it starts exposure can be arranged with homogeneity, the time interval of the image photoed continuously can be extremely made into an equal, and a motion of the photographic subject in two or more images photoed continuously will be expressed as a more natural thing.

[0070] Furthermore, since the release time lag tangent line 5 is made to regularity also in any of a single copy and continuous shooting, control of the photography sequence in CPU30 becomes easy, and circuit magnitude can be made small.

[0071] In addition, this invention is not restricted to this, and of course [although the case where each gestalt of each above-mentioned implementation is adapted for a digital still camera is explained / if it is equipment of a drawing

device and a mechanical shutter which has either at least and photos an independent still picture, the still picture which continued in time, and an animation using an electronic image sensor], it becomes applicable like a digital camcorder.
[0072] In addition, let this invention be what has possible deforming variously and carrying out within limits which do not deviate not only from the gestalt of the above-mentioned implementation but from its summary.
[0073] Furthermore, invention of various phases is included in the gestalt of the above-mentioned implementation, and various invention may be extracted by the proper combination in two or more requirements for a configuration indicated. For example, even if some requirements for a configuration are deleted from all the requirements for a configuration shown in the gestalt of operation, at least one of the technical problems stated in the column of the technical problem which invention tends to solve is solvable, and when at least one of the effectiveness stated in the column of an effect of the invention is obtained, the configuration from which this requirement for a configuration was deleted may be extracted as invention.
[0074]
[Effect of the Invention] Since release time lag was made to become always fixed from actuation initiation of drawing according to the maximum time amount required by actuation termination according to invention according to claim 1, Since it shall very be easy to grasp release timing, without changing release time lag according to the magnitude of opening of drawing in the event even if it faces photography of the photographic subject which moves especially at a high speed It becomes possible to perform photography as the intention which release timing always suited.
[0075] Since release time lag was made to become always fixed according to the maximum time amount taken to complete the shift to an open condition from the closed state of a mechanical shutter according to invention according to claim 2, Even if it faces photography of the photographic subject which moves especially at a high speed, while being very easy to grasp release timing, without changing release time lag according to actuation of a mechanical shutter Since release time lag is made to regularity also in any of a single copy and continuous shooting Control of a photography sequence can become easy, and circuit magnitude can be made small, in addition the time interval of two or more photography images can be extremely made into an equal especially at the time of continuous shooting, and a motion of the photographic subject in two or more images photoed continuously can be expressed as a more natural thing.
[0076] Since release time lag was made to become always fixed from either of the maximum time amount taken to complete the shift to the open condition required by actuation termination from actuation initiation of drawing from the closed state of the maximum time amount and a mechanical shutter according to the longer one according to invention according to claim 3, Even if it faces photography of the photographic subject which moves especially at a high speed, while being very easy to grasp release timing, without changing release time lag Since release time lag is made to regularity also in any of a single copy and continuous shooting, control of a photography sequence becomes easy and circuit magnitude can be made small.

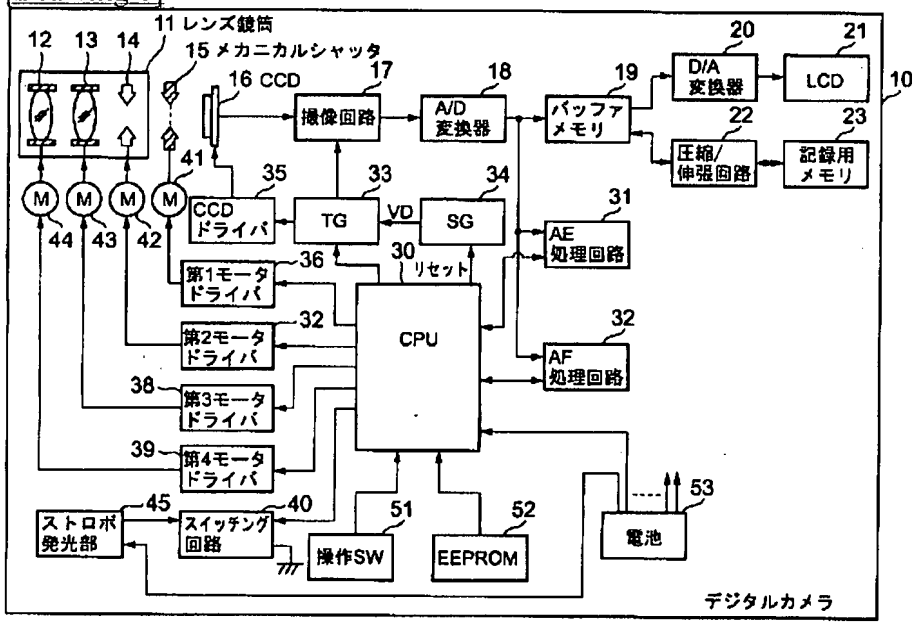
[Translation done.]

* NOTICES *

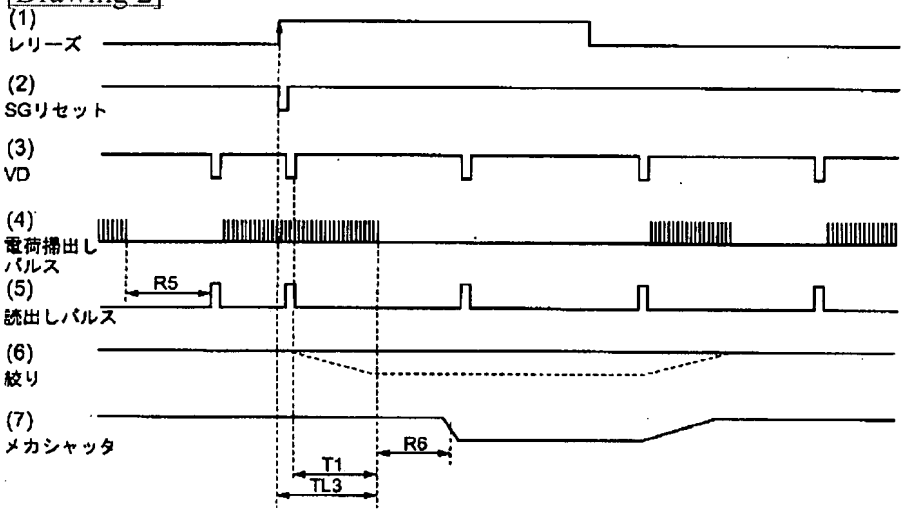
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

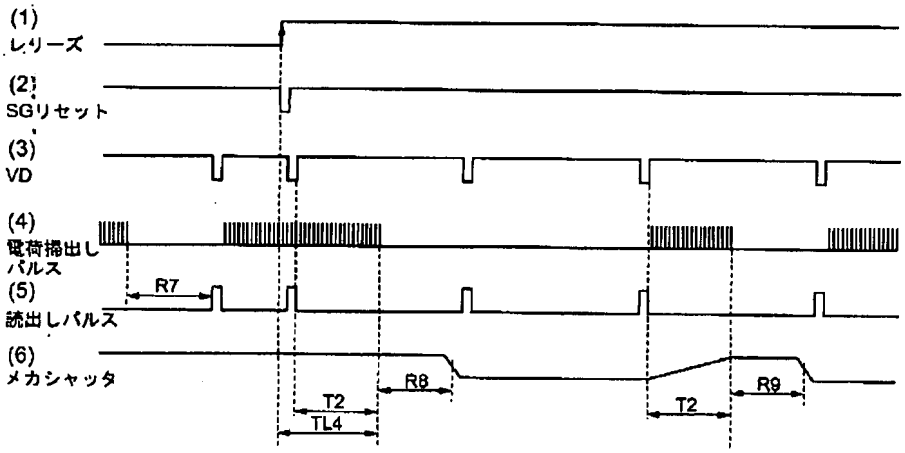
[Drawing 1]



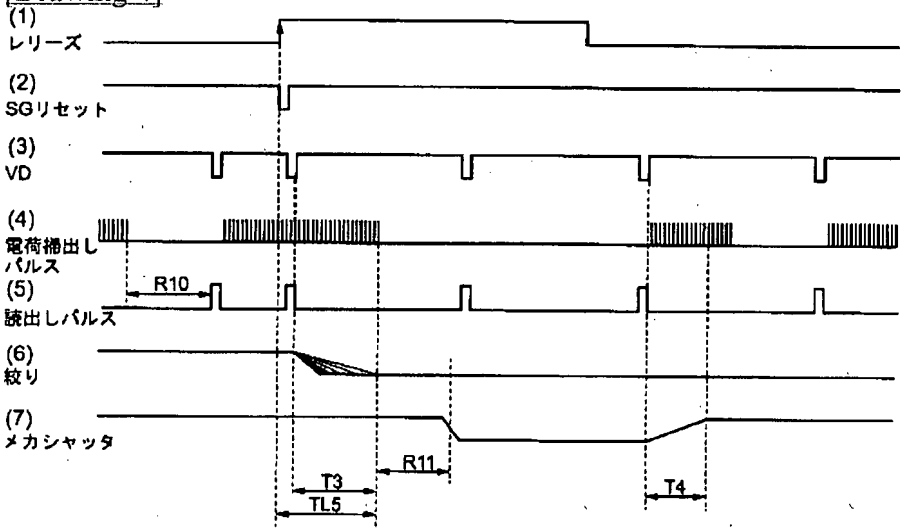
[Drawing 2]



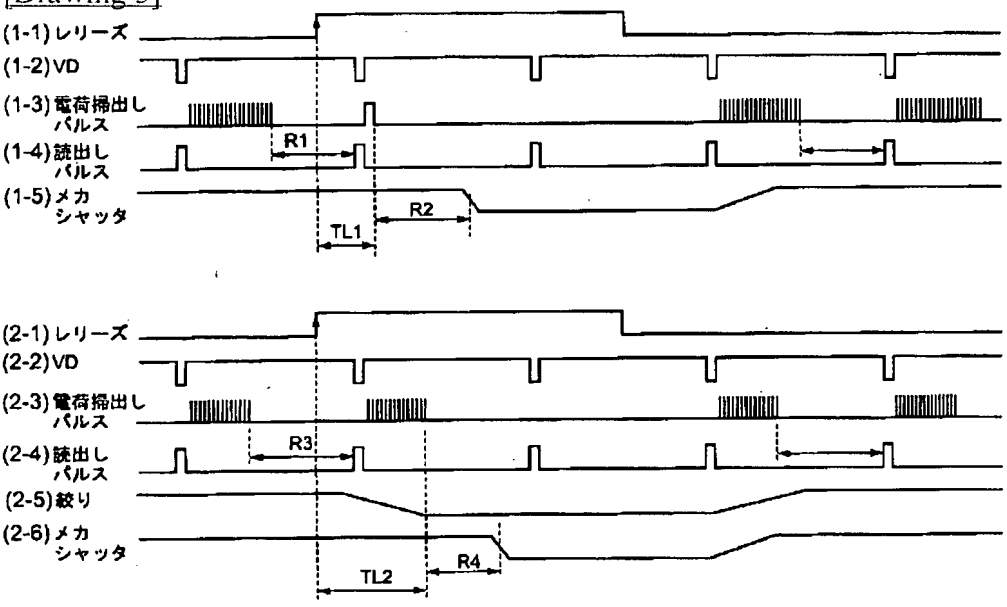
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Translation done.]